

SECTION 02732 SANITARY SEWERS (GRAVITY)

PART 1 - GENERAL

1.1 SUMMARY

- A. This specification applies to PVC pipe and fittings for gravity sanitary sewer lines.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions apply to this Section.
- B. Section 02222 – Excavation for Utilities

1.3 SUBMITTALS

- A. Submit shop drawings for all products specified in this section in accordance with the requirements of General and Supplementary Conditions.

PART 2 - PRODUCTS

2.1 PIPE

- A. Polyvinyl Chloride (PVC) pipe shall to meet and/or exceed the requirements of ASTM D3034, SDR 35; it shall be suitable for use as a gravity sewer conduit with provisions for contraction and expansion at each joint; with a rubber ring and standard lengths of 20 feet and 12.5 feet plus or minus one inch; it shall be designed to pass all tests at 73 degrees F (plus or minus three degrees F). Pipe material shall have a cell classification of 12364B as defined in ASTM D1248.
- B. The pipe shall meet ASTM D2444 with no evident splitting or shattering (denting is not considered a failure).
- C. Lateral branches shall be wyes of the same material as the main sewer and have a six inch inside diameter, unless otherwise specified or noted. All wyes and other fittings able to withstand all test pressures involved without leakage. All fittings shall have rubber push on joints similar to the pipe joints.

2.2 JOINTS AND JOINTING MATERIALS

- A. Joints for sewer plastic pipe shall meet all requirements of ASTM D3212 standard specifications. Joint design shall be tested and certified to result in no leakage under prescribed laboratory test conditions of joint alignment, load conditions, pressure and vacuum, and deflection. Pipe and fittings shall have integral bell with elastomeric seal joint. Gaskets shall conform to ASTM F427.

2.3 COMPRESSION COUPLINGS

- A. When dissimilar pipe materials like PVC and concrete pipe are joined, use compression couplings that are resistant to the corrosive action of soils and sewage and that will provide a permanent watertight joint. The compression couplings shall be of natural or synthetic rubber or rubber-like material and shall comply with the requirements and test methods specified in Table 2 of ASTM C425. The coupling shall meet the leak requirements specified in ASTM C425, and the bands for attaching the couplings to the dissimilar pipes shall be of stainless steel meeting ASTM A167 or A240. Each coupling shall bear the manufacturer's identifying mark and an indication of its size.

PART 3 - EXECUTION

3.1 PIPE LAYING

- A. Lay no pipe except in the presence of an inspector representing the Construction Manager (CM).
- B. Before placing sewer pipe in position in the trench, carefully prepare the bottom and sides of the trench, and install any necessary bracing and sheeting as provided in Section 02222 – Excavation for Utilities.
- C. Wherever necessary to provide satisfactory bearing surface, place concrete cradles as shown on the drawings or as directed by the CM. Cradles shall be of concrete and conform to the dimensions shown on the drawings. Concrete placed outside the dimensions shown shall be at the Contractor's expense.
- D. A laser shall be used to set the line and grade of each sewer. The laser type and procedures shall be approved by the CM. Set reference points for both line and grade at each manhole. Where grades are 0.6% or less, check the elevation of the beam each 100 feet with an offset point or engineer's level.
- E. Do not allow water to run or stand in the trench while pipe laying is in progress or before the trench has been backfilled. Do not at any time open up more trench than the available pumping facilities are able to dewater.
- F. Correct trench bottoms which are found to be unsuitable for foundations after pipe laying operations have started, bringing them to exact line and grade with compacted earth as necessary.
- G. Carefully inspect each piece of pipe and special fitting before it is placed, and lay no defective pipe in the trench. Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the bells upgrade. When pipe laying is not in progress, keep the ends of the pipe tightly closed with an approved temporary plug.
- H. Before constructing or placing any joints, demonstrate to the CM, by completing at least one sample joint, that the methods to be used will conform to the specifications, will provide a watertight joint, and further that the workmen to be involved in this phase of work are thoroughly familiar and experienced with the type of joint proposed.
- I. No other type of joint may be used unless authorized in writing by the CM.
- J. Install tee branches in sewer lines to serve each connection. If tee branches are not to be used immediately, close them with approved stoppers that are held in place to prevent infiltration and withstand all test requirements.
- K. New service laterals shall conform to the details shown on the drawings.
- L. As the work progresses, thoroughly clean the interior of the pipe in place. After each line of pipe has been laid, carefully inspect it, and remove all earth, trash, and other foreign matter from its interior.

- M. After the joints have been completed, they shall be inspected, tested, and accepted by the CM before being covered. The pipe shall meet the test requirements for watertightness; immediately repair any leak or defect discovered at any time after completion of the work. Any pipe that has been disturbed after joints were formed shall be taken up, the joints cleaned and remade, and the pipe relaid at the Contractor's expense. Carefully protect all pipe in place from damage until backfilling operations are completed.
- N. Do not begin the backfilling of trenches until the pipe in place has been inspected and approved by the CM.
- O. Lay sewers at least ten feet horizontally from any existing or proposed water main. If this is not practical, the sewer may be laid closer than ten feet to a water main provided it is laid in a separate trench and the elevation of the top of the sewer is at least 18 inches below the bottom of the water main.
- P. Where a sewer crosses under water mains, the top of the sewer shall be at least 18 inches below the bottom of the water main. If the elevation of the sewer cannot be varied to meet the above requirements, either relocate the water main to provide this separation, or else reconstruct it with mechanical joint ductile iron pipe for a distance of ten feet on each side of the sewer with a full joint of the water main centered over the sewer, construct the sewer line of ductile iron pipe conforming to Section 02667 and pressure test the sewer prior to acceptance.
- Q. If it is impossible to obtain proper horizontal and vertical separation as stipulated above, construct both the water main and the sewer of mechanical joint ductile iron pipe, and pressure test each.
- R. Join dissimilar pipe by using suitable compression couplings. If compression couplings are not available, make jointing with a special fabricated coupling approved by the CM.
- S. Carefully protect from damage all existing sewers, water lines, gas lines, sidewalks, curbs, gutters, pavements, electrical lines, and other utilities or structures in the vicinity of the work at all times. If it is necessary to repair, remove, and/or replace any such utility or structure in order to complete the work properly, do so in compliance with the provisions set forth in other section of these specifications. Any such work shall be considered incidental to the construction of pipe sewers, and no additional payment will be allowed therefor.

3.2 TESTING OF GRAVITY SEWERS

- A. Visual Tests
 - 1. Upon completion of the construction or earlier if the CM deems advisable, the CM will make a visual inspection of the sewer and construction site. Immediately repair all leaks and defects found by such inspection.
 - 2. In addition to general cleanup and leakage, the following standards shall be used to determine failure or defects of this project.
 - 3. Sewers shall be built so as to remain true to line and grade. The inclining grade of the bottom of the sewer after completion shall be such that, after flooding, the flood water drains off so that no remaining puddle of water is deeper than 1/2 inch on pipe 36 inches internal diameter or smaller and 3/4 inch on pipe larger than 36 inches internal diameter. Any section of pipe that does not comply with the specifications at any time previous to final acceptance of the work shall be replaced or relaid at the Contractor's expense.
 - 4. The Contractor will be held strictly responsible that all parts of the work bear the load of the backfill. If cracks 1/100 inch develop in the pipe within one year from the date of final acceptance of the work, the Contractor will be required to replace, at his expense, all such cracked pipe. To this end, the Contractor is advised to purchase pipe under a guarantee from the manufacturer, guaranteeing proper service of sewer pipe under conditions established by the drawings, specifications, and local conditioning at the site of the work.

B. Air Testing for Sewers 24 Inches and Smaller

1. Perform low pressure air testing as follows:
 - a. Furnish all equipment, facilities, and personnel necessary to conduct the test. The test shall be observed by a representative of the Construction Manager.
 - b. Make the air test after all services have been installed and backfilling has been completed and compacted.
 - c. Perform the first series of air tests after 2,000 LF but before 4,000 LF of sewer has been laid. The purpose of this first series of tests is to assure both the Contractor and the CM that the materials and method of installation meet the intent of these specifications. Conduct the remainder of the tests after approximately each 10,000 LF has been laid.
 - d. Plug all tees and ends of sewer services with flexible joint plugs or caps securely fastened to withstand the internal test pressures. Such plugs or caps shall be readily removable, and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.
 - e. Prior to testing, check the pipe to see that it is clean. If not, clean it by passing a full-gauge squeegee through the pipe. It shall be the Contractor's responsibility to have the pipe cleaned.
 - f. Immediately following this check or cleaning, test the pipe installation with low pressure air. Supply the air slowly to the plugged pipe installation until the internal air pressure reaches 4.0 psi more than the average back pressure of any ground water that may submerge the pipe. Allow at least two minutes for temperature stabilization.
 - g. The pipeline shall be considered acceptable when tested at an average pressure of 3.0 psi more than the average back pressure of any ground water that may submerge the pipe, if the section under test does not lose air at a rate greater than 0.0015 cfm per square foot of internal pipe surface area. Calculate the pressure drop as the number of seconds for the air pressure to drop from a stabilized pressure of 3.5 to 2.5 psi more than the average back pressure of any ground water that may submerge the pipe. Calculate time as described in ASTM C828.
 - h. The requirements of this specification shall be considered satisfied if the time required in seconds for the pressure to decrease from 3.5 to 2.5 psi more than the average back pressure of any ground water that may submerge the pipe is not less than that shown in the following table:

ALLOWABLE AIR LOSS VALUES PER 100 LF

Pipe Size	Time in Seconds
6 inches	42
8 inches	72

- i. If the pipe installation fails to meet these requirements, the Contractor shall determine at his own expense the source or sources of leakage and repair or replace all defective materials or workmanship. The completed pipe installation shall meet the requirements of this test before being considered acceptable.
2. The recommended procedures for conducting acceptance tests are as follows:
 - a. Clean pipe that is to be tested.
 - b. Plug all pipe outlets with suitable test plugs, and brace each plug securely.
 - c. Increase gauge pressure in the test by the amount of ground water pressure at the crown of the pipe.
 - d. Add air slowly to the portion of the pipe installation being tested until the internal air pressure is raised to 4.0 psi more than the average back pressure above the crown of the pipe.
 - e. After the above internal pressure is obtained, allow at least two minutes for air temperature to stabilize, adding only the amount of air required to maintain pressure.

- f. After two minutes, disconnect the air supply.
 - g. When pressure decreases to 3.5 psig either by leaking down or by bleeding down with a release valve, start the stopwatch, and determine the time in seconds that is required for the internal air pressure to reach 2.5 psig. Compare this time interval as calculated above. If the time is more than that calculated, the test shall be assumed to be acceptable.
- 3. Plugs used to close the sewer pipe for the air test must be securely braced to prevent the unintentional release of a plug, which can become a high velocity projectile. Locate gauges, air piping manifolds, and valves at the top of the ground. No one shall be permitted to enter a manhole where a plugged pipe is under pressure. Four pounds air pressure (gauge) develops a force against the plug in a 12 inch pipe of approximately 450 pounds. Pipes more than 30 inches in diameter shall not be air tested because of the difficulty of adequately blocking the plugs. Provide a safety release device set to release at 10 psi between the air supply and the sewer under test.
- 4. Regardless of the outcome of the tests, repair any noticeable leak.

3.3 VISUAL INSPECTION OF MISCELLANEOUS MATERIALS

- A. All material used on this project will be visually inspected by the CM at the site for conformance to the required specifications. When reasonable doubt exists that said material meets the specifications, the CM may require certified mill tests, samples, and/or tests by an independent laboratory or other suitable form of verification that the material meets the required specifications.

3.4 DEFLECTION TESTING FOR PVC PIPE

- A. Test deflection of the pipe by passing a nine-arm pin go/no-go mandrel sized to 95% of the pipe diameter of the actual pipe used with the pipe in place and covered. Make this acceptance test after backfill consolidation has occurred.

3.5 CLEANUP

- A. After completing each section of the sewer line, remove all debris, construction materials, and equipment from the site of the work, grade and smooth over the surface on both sides of the line, and leave the entire construction area in a clean, neat, and serviceable condition.

END OF SECTION 02732